423-41-45

Interface Control Document Between EOSDIS Core System (ECS) and the National Snow and Ice Data Center (NSIDC) Distributed Active Archive Center (DAAC) for the ECS Project

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National Aeronautics and Space Administration

Goddard Space Flight Center
Greenbelt, Maryland

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Preface

This document is a formal contract deliverable with an approval code 1. It requires Government review and approval prior to acceptance and use. This document is under ESDIS contractor configuration control. Once this document is approved, Contractor approved changes are handled in accordance with Class I and Class II change control requirements described in the EOS Configuration Management Plan, and changes to this document shall be made by document change notice (DCN) or by complete revision.

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Abstract

This Interface Control Document (ICD) defines the functional and physical design of each interface between ECS and the DAAC-Unique System at National Snow and Ice Data Center (NSIDC) and includes the data contents and format for each interface. Additionally, data rates, frequencies, file sizes, error conditions, and error handling procedures and security are included or a place holder has been inserted for updating as the information becomes available. The sequence of exchanges is described, as are the details for communications protocols or physical media for each interface.

In particular, this ICD describes Version Ø System-to-ECS (VØ/ECS) data flows, specifically, for ingesting data products; internetworking for VØ/ECS interoperability; and internetworking between ECS and the NSIDC DAAC via external networks.

This ICD includes the precise data contents and format for each interface addressed in this document. State diagrams are provided which identify all states, events/conditions, error handling procedures, and security are included. Communications protocols or physical media are also addressed for each interface.

This ICD is consistent with the external systems interface requirements at the NSIDC DAAC, as described in the Earth Science Data and Information System (ESDIS) Project -- Level 2 Requirements, the Functional and Performance Requirements Specification for the Earth Observing System Data and Information System (EOSDIS) Core System (ECS level 3 requirements) and the Interface Requirements Document (IRD) Between ECS and the Version Ø System.

Keywords: active, ADEOS II, archive, DAAC, DCE, EBnet, ECS, ftp, NSIDC, ODL, PDR, PDRD, product delivery record, product delivery record discrepancy, production acceptance notification, PVL, VØ.

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1. Introduction

1.1 Identification

This Interface Control Document (ICD), Contract Data Requirements List (CDRL) Item 029 whose requirements are specified in Data Item Description (DID) 209/SE1, is a required deliverable under the Earth Observing System Data and Information System (EOSDIS) Core System (ECS), Contract (NAS5-60000).

1.2 Scope

This Interface Control Document (ICD) defines the functional and physical design of those interfaces between ECS and the DAAC-unique system at NSIDC that are needed to ingest products that need to be archived and distributed by ECS or to ingest the required ancillary data products for support of the ECS product generation for the ECS Release B. This ICD does not explicitly define ECS user interfaces.

ECS Releases are keyed to mission support: Release Ir1 provides support to TRMM Early Interface Testing and Science Algorithm I&T. Release B testbed provides the functional capabilities needed to support early ESDIS Ground System Testing for the EOS AM-1 and Landsat 7 missions. Release B provides support to EOS AM-1 Mission Operations and Science Operations, and it provides support to ESDIS Ground System Certification Testing for the EOS AM-1 and Landsat 7 missions. Release B also provides archive and distribution services for the Landsat 7 mission. Releases C & D provide evolutionary enhancements to the ECS services provided in the earlier Releases.

This ICD does not address:

a. Data flows for V0-to-V1 data migration — these data flows are fully addressed in the Version 1 Data Migration Plan White Paper, 1/95.

b. Version 0 catalog interoperability data flows; these are included in the Interface Control Document Between the EOSDIS Core System (ECS) and the Version 0 System.

The Earth Science Data and Information System (ESDIS) Project has responsibility for the development and maintenance of this ICD. Any changes in the interface requirements must be agreed to, and assessed at the ESDIS Project Level. This ICD will be approved under the signature of the ESDIS Project Manager.

This document reflects the technical baseline maintained by the ECS Configuration Control Board in accordance with ECS technical direction (see Section 2.2).

1.3 Purpose and Objectives

This document is written to formalize the interpretation and general understanding of the interfaces between ECS and non-ECS components of the NSIDC DAAC-Unique System. This document is intended to provide clarification and elaboration of the ECS/non-ECS system interfaces at the NSIDC DAAC to the extent necessary to assure hardware, software, and operational service compatibility within the end-to-end system.

This document provides a point of mutual control of external interface definitions between the ECS and the NSIDC DAAC via the ESDIS Configuration Control Board (CCB).

1.4 Status and Schedule

This is the preliminary ICD for the ECS/non-ECS system interfaces at the NSIDC DAAC which will be implemented in ECS Release B. This ICD has been submitted as an ECS Project CCB approval Code 1 document. At the Government's option, this document may be designated to be under full Government CCB control. Changes may be submitted for consideration by Contractor and Government CCBs under the normal change process at any time.

Within this document are some interfaces that are yet To Be Determined (TBD), To Be Resolved (TBR), and/or To Be Supplied (TBS) items. A Work-Off Plan is included in Appendix A for resolving these items. This plan provides the following information:

a. ICD I/F Issue Number

b. ICD Reference Paragraph

c. ICD Issue Priority

d. ICD Issue Type - Description

e. Work-off Plan Task(s)

f. Projected Resolution Date

g. Risk Assessment.

1.5 Organization

This document is organized in 5 sections and 2 appendices:

Section 1 provides information regarding the identification, scope, purpose and objectives, and organization of this document.

Section 2 contains information about documentation relevant to this ICD, including parent, applicable, and information documents.

Section 3 provides an overview of the interfaces, with a brief description of the elements involved.

Section 4 provides an overview of the data exchange approaches.

Section 5 contains a description of each data exchange between the ECS and the NSIDC DAAC-Unique System, the data transfer method, and descriptions of the data format.

Appendix A contains a table which identifies a Work-off Plan for all TBRs, TBSs and/or TBDs.

Appendix AB contains a list of abbreviations and acronyms.

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2. Related Documentation

2.1 Parent Documents

The following are parent documents from which this document's scope and content derive:

193-208-SE1-001	Methodology for Definition of External Interfaces for the ECS Project
301-CD-002-003	System Implementation Plan for the ECS Project
423-10-01-5	Goddard Space Flight Center, Earth Science Data and Information System (ESDIS) Project Level 2 Requirements, Volume 5: EOSDIS Version 0; through CH-01
423-41-01	Goddard Space Flight Center, EOSDIS Core System (ECS) Statement of Work, through CN-14
423-41-02	Goddard Space Flight Center, Functional and Performance Requirements Specification for the Earth Observing System Data and Information System (EOSDIS) Core System (ECS) Revision A through CH-06
505-10-20	Goddard Space Flight Center, System Interface Control Plan for the Earth Science Data and Information System (ESDIS) Project
505-41-11	Goddard Space Flight Center, Interface Requirements Document Between EOSDIS Core System (ECS) and the Version 0 System

2.2 Applicable Documents

The following documents are referenced herein and are directly applicable to this document. In the event of conflict between any of these documents and this ICD, this document shall take precedence. Please note that Internet links cannot be guaranteed for accuracy or currency.

206-CD-001-002	Version 0 Analysis Report for the ECS Project
209-CD-001-003	Interface Control Document Between EOSDIS Core System (ECS) and the NASA Science Internet
305-CD-024-002	Release B SDPS Data Server Subsystem Design Specification for the ECS Project
305-CD-025-002	Release B SDPS Ingest Subsystem Design Specification for the ECS Project
305-CD-028-002	Release B CSMS Communications Subsystem Design Specification for the ECS Project

305-CD-029-002	Release B CSMS Management Subsystem Design Specification for the ECS Project
311-CD-008-001	Release B Science Data Processing Segment (SDPS) Database Design and Database Schema Specifications for the ECS Project
311-CD-003-005	Communications and System Management Segment (CSMS) Database Design and Database Schema Specifications for the ECS Project
313-CD-006-002	Release B SDPS/CSMS Internal Interface Control Document for the ECS Project
175-WP-001-001	HDF-EOS Primer for Version 1 EOSDIS (White Paper for the ECS Project)
210-TP-001-006	Technical Baseline for the ECS Project, 2/14/96
420-TP-015-001	B.0 Earth Science Data Model for the ECS Project
420-TP-016-001	Backus-Naur Format (BNF) Representation of the B.0 Earth Science Data Model for the ECS Project
505-41-37	Goddard Space Flight Center, Interface Control Document between the EOSDIS Core System (ECS) and the Version Ø System for Interoperability.
CCSDS 641.0-B-1	Consultative Committee for Space Data Systems (CCSDS), Parameter Value Language Specification (CCSD0006), Blue Book
none	Goddard Space Flight Center, ECS Technical Direction No. 11, “PDR Technical Baseline”
none	Goddard Space Flight Center, Science Data Plan for the EOS Data and Information System Covering EOSDIS Version 0 and Beyond, Document Version 3
none	Davis, Randy; University of Colorado Laboratory for Atmospheric and Space Physics: User’s Guide for the Object Description Language (ODL) Processing Software Library, Release 2.1 DRAFT
none	Planetary Data System Standards Reference, Version 3.1, (WWW access: http://stardust.NSIDC .nasa.gov/stdref/stdref.html)
RFC 791	Internet Protocol, J. Postel (WWW access: gopher://ds.internic. net:70/)
RFC 793	Transmission Control Protocol, J. Postel (WWW access: gopher://ds.internic.net:70/)
RFC 821	Simple Mail Transfer Protocol (SMTP)
RFC 959	File Transfer Protocol, Internet Standards, J. Postel, J. Reynolds (WWW access: gopher://ds.internic.net:70/)

RFC 1157 A Simple Network Management Protocol (SNMP), J. Case, M. Fedor, M. Schoffstall, J. Davin (WWW access: gopher://ds. internic.net:70/)

2.3 Information Documents

The following documents, although not directly applicable, amplify or clarify the information presented in this document, but are not binding.

604-CD-001-004 Operations Concept for the ECS Project: Part 1-- Overview

604-CD-002-003 Operations Concept for the ECS Project: Part 2B -- Release B

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3. Interface Overview

The National Snow and Ice Data Center (NSIDC), located at the University of Colorado in Boulder, is the primary U.S. archive for snow and ice data. The Snow and Ice DAAC hosted by NSIDC (hereinafter referred to as the NSIDC DAAC) is part of the Earth Observing System Data and Information System (EOSDIS). NSIDC serves research and educational communities studying cryopheric and polar processes with data and data products generated from Earth observation satellites and ancillary in situ measurements. The NSIDC DAAC is an integral part of the multiagency-funded efforts at NSIDC to provide snow and ice data management services.

3.1 ECS/NSIDC DAAC-Unique System Overview

The ECS and the DAAC-unique components residing at the NSIDC DAAC are collocated at the NSIDC. These components work in coordination to provide user access, data archive, data cataloging, and data distribution access to products. The exchange of data between these components is supported by communication/networking services provided as part of the ECS or provided by NSI.

The ECS and the NSIDC DAAC-Unique System work in coordination to provide user access, data archive, metadata cataloging and product distribution functions for the data products ingested by ECS from the NSIDC DAAC.

3.2 ECS/NSIDC DAAC-Unique System Interfaces

System interfaces between ECS and the NSIDC DAAC-Unique System provide the means for transferring NSIDC products and for sending messages supporting data transfer. Table 3-1 provides an overview of the interfaces between ECS and the NSIDC DAAC-Unique System for ingested data products and associated metadata along with the information required to implement the interfaces. The interfaces listed in Table 3-1 are described within Sections 4 and 5 of this ICD to support ECS and NSIDC DAAC-Unique design and test activities.

Table 3-1. ECS-NSIDC DAAC-Unique System Interfaces

Source	Destination	Message	Data	Transfer Mechanism
NSIDC DAAC-Unique System	ECS	Product Delivery Record		ftp
ECS	NSIDC DAAC-Unique System	*Product Delivery Record Discrepancy		ftp and e-mail
NSIDC DAAC-Unique System	ECS	N/A	AMSR Level 1B Product	ftp
ECS	NSIDC DAAC-Unique System	Production Acceptance Notification		ftp

*This message is used only in the event of an error in the Product Delivery Record

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4. Data Exchange Framework

Section 4 describes the data exchange framework supporting the ECS/NSIDC DAAC-Unique System interfaces presented in Section 3.2. The descriptions include network topologies, internetworking protocols, electronic data exchange, data exchange interfaces, physical media data exchange, data exchange formats and data exchange security. Section 5 describes the data flows between ECS and the DAAC-Unique components at the NSIDC DAAC.

4.1 Internetworking Protocols and Network Topology

ECS provides internetworking services that are based on protocols and standards corresponding to layers 1 through 4 of the Open Systems Interconnection (OSI) Reference Model, specified in RFC 1510--these include, respectively, the physical, datalink, network, and transport layers. The transport layer protocol provides data consistency functions. The network, datalink and physical layers play significant roles in defining external interfaces (i.e., between ECS and non-ECS networks/systems). In particular, ECS routers provide the physical demarcation points between ECS networks and external networks/systems--the routing software (resident within routers) provides network layer services, while the interfaces on the router make up the datalink/physical layers.

4.1.1 Transport Layer Protocol

The transport layer protocol used for communications between ECS processes and non-ECS processes at the NSIDC DAAC is the Transmission Control Protocol (TCP) specified in RFC 793. TCP is a connection-oriented, end-to-end reliable protocol designed to fit into a layered hierarchy of protocols which support multi-network applications. It provides for reliable inter-process communication between pairs of processes in host computers attached to networks within and outside of ECS.

The interface between TCP and an application process consists of a set of calls much like the calls an operating system provides to an application process for manipulating files. For example, there are calls to open and close connections and to send and receive data on established connections. TCP can also asynchronously communicate with application programs such as those based on Distributed Computing Environment (DCE).

4.1.2 Network Layer Protocols

The network layer provides the functional and procedural means to exchange network data units (i.e., packets) between devices over network connections, both for connection-mode and connectionless-mode communications. It relieves the transport layer of any concern regarding routing and relay operations associated with network connection. The basic function of the network layer is to provide the transparent transfer of data between devices. It should be noted that the network layer delivers packets only to a device, not an individual process--it remains up to the

transport layer protocol to include, beforehand, the additional information needed to permit addressing to an individual process. Network layer protocols supported by ECS networks include Internet Protocol (IP) plus various routing protocols.

4.1.2.1 Internet Protocol (IP)

The Internet Protocol (IP), specified in RFC 791 is the network protocol that ECS supports, based on its dominance in industry usage and wide-community support. As part of IP support, Internet Control Message Protocol (ICMP) and Address Resolution Protocol (ARP) are also supported. As the Internet Engineering Task Force (IETF)-specified new generation IP becomes available for deployment, it will be supported by ECS networks.

4.1.2.2 Routing

ECS generally uses Routing Information Protocol (RIP) for route exchanges with external networks. Other more robust routing protocols such as Border Gateway Protocol (BGP-4) can also be used depending on the need and center routing policies. The specific routing implementation at NSIDC is specified in the EBnet Distributed Active Archive Center (DAAC) ICD.

4.1.3 Physical/Datalink Layer Protocols

At the NSIDC DAAC the interface to the VØ DAAC Local Area Network (LAN) is via Fiber Distributed Data Interface (FDDI), and is implemented by a FDDI connection into an ECS DAAC router. The interface between the ECS DAAC router and other networks is specified in the EBnet to Distributed Active Archive Center (DAAC) ICD.

4.1.4 Network Topology

The VØ DAAC LAN is attached to the ECS DAAC Router via a FDDI connection as depicted in Figure 4-1. The interface between the ECS system at the NSIDC DAAC and other networks is currently specified in the EBnet to Distributed Active Archive Center (DAAC) ICD.

4.2 Communications Protocols

ECS provides various communications services that are based on protocols and standards corresponding to the applications level of the Open Systems Interconnection (OSI) Reference Model. Some of these services include the Simple Mail Transport Protocol (SMTP) and File Transfer Protocol (ftp).

4.2.1 Simple Mail Transport Protocol (SMTP)

All electronic mail (e-mail) message exchange is achieved through the use of Internet e-mail messages. The protocol for Internet e-mail transfer is the Simple Mail Transfer Protocol (SMTP) defined in RFC 821.

4.2.2 File Transfer Protocol (ftp)

File transfers between ECS and the NSIDC DAAC Server are accomplished through the use of standard File Transfer Protocol (ftp). FTP, as described in RFC 959, is an internet standard for file transfers that support downloading of files, by a user (acting as a client), from a remote server.

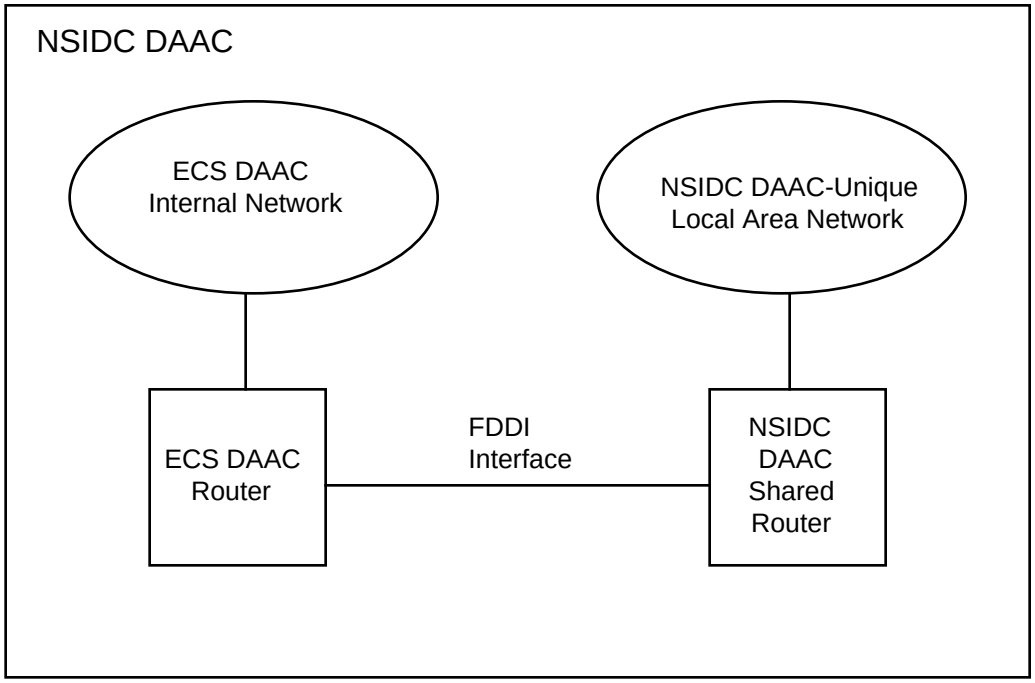

Figure 4-1. ECS/NSIDC DAAC-Unique System Network Topology

4.3 Data Product Exchange Between ECS and NSIDC DAAC-Unique System

Data exchange between the ECS and the DAAC-unique components at NSIDC consists of data products being sent from the DAAC-unique components to the ECS components at the DAAC. Data transfer is accomplished through the use of ECS Polling Ingest with Product Delivery Record process, as defined in the Release B SDPS Ingest Subsystem (INS) Design Specification for the ECS Project.

4.3.1 Product Ingest by Polling with Product Delivery Record

The purpose of the ECS/VØ System electronic interface is to support the delivery of the data product files from the NSIDC VØ System to ECS at the NSIDC DAAC. A Polling Ingest with Product Delivery Record mechanism is employed for the purpose of transferring the data product

files to ECS. To accommodate this interface, a single server will be identified; the data product files and the Product Delivery Records (PDRs) will be placed on this PDR Server by the NSIDC VØ System. At the end of this data exchange, whichever side of the interface has administrative control of this PDR Server, will clean the Server disk of the PDR and data product files. This implementation of the Polling Ingest with PDR consists of the following steps (see Figure 4-2).

(1) The NSIDC VØ System places the "data/metadata" files on the PDR Server in a directory specified in the PDR.

The name of the PDR Server and the name of the specified directory on the PDR Server are operator tunable parameters.

(2) The NSIDC VØ System generates a PDR and places the PDR on the PDR Server in a known directory.

(3) With operator tunable frequency, ECS polls the directory on the PDR Server, detects the PDR's presence, and retrieves the PDR.

The ECS side of the interface is equipped with an ftp daemon---a computer program which automatically, and with operator-tunable frequency, polls the PDR Server, detects a PDR file via a ftp "ls" command, and acquires the PDR via a ftp "get" command. At the PDR Server, an ftp daemon continually listens for incoming ftp requests, acts on each arriving ftp request, and routes each ftp request to the appropriate account, making the directory sub-tree available to ECS with the allowable privileges.

(4) If ECS detects errors in the PDR information, ECS sends a Product Delivery Record Discrepancy (PDRD) to the NSIDC VØ System via both ftp and e-mail indicating errors found in PDR.

Once a PDR has been acquired by ECS, the PDR data is validated. In the event that a discrepancy is found in the PDR, ECS automatically returns a Product Delivery Record Discrepancy (PDRD) via both ftp and e-mail to NSIDC. The subject of the e-mail will be the PDRD file name and the e-mail address is an operator-tunable parameter. If the PDR is valid, ECS schedules to pull the Data/Metadata File (DMF) using a ftp "get" command. In this case no PDRD is sent. If an error is detected in the PDR, processing is terminated and none of the files listed in the PDR are ingested by ECS until a corrected PDR is received and successfully processed.

(5) ECS ingests the DMF from the PDR Server via a ftp "get" command. The DMF is then archived.

(6) ECS sends a Production Acceptance Notification (PAN) to the NSIDC VØ System via ftp, indicating either success or errors found.

Operator tunable parameters for the transfer of the PDR, PDRD and PAN include the time between receipt of a failure by ECS Ingest and the sending of a new PDRD/PAN, and the time that NSIDC VØ System waits to receive a PDRD or PAN before placing another PDR in the directory on the PDR Server. All relevant operator tunable parameters will be documented in the operations

procedures for the NSIDC VØ Systems and ECS as an integral part of the DAAC Operations Manual (DID 611).

The Polling Ingest with PDR transfer mechanism is fully automated. In the context of this transfer mechanism, this section addresses the PDR, PDRD and PAN. In addition, the error conditions, error handling/backup methods, and physical media are discussed herein.

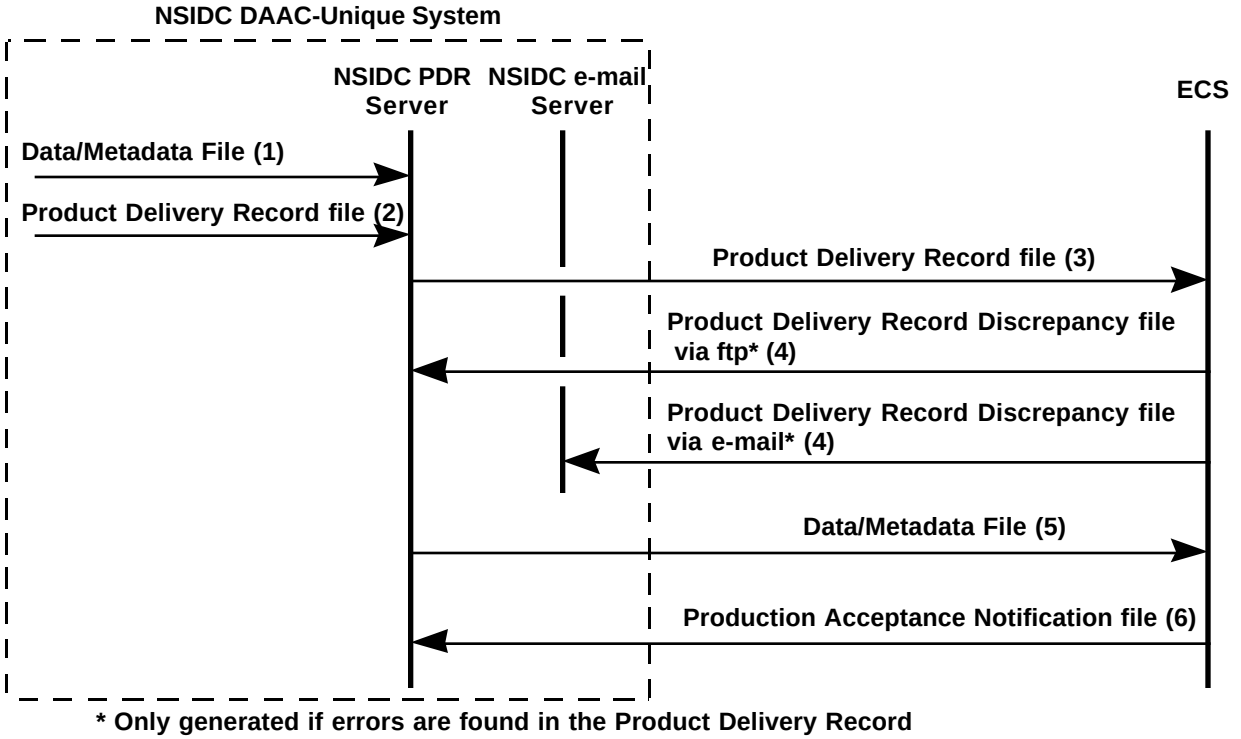

Figure 4-2. ECS/NSIDC DAAC-Unique Product Data File Transfer Mechanism

4.3.2 Product Delivery Record (PDR)

The purpose of the PDR is to announce the availability of a DMF for transfer, including file names, file size, location, etc. The PDR is generated and placed in a pre-specified directory on the PDR Server by the system supplying the data (i.e., the NSIDC VØ System) after the data files referenced in the PDR have been placed into their respective directories. Both the server and the directory are operator configurable parameters. ECS polls the PDR Server, detects/acquires/validates the PDR, and schedules to pull the data.

The PDR format is comprised of Parameter-Value Language (PVL) Statements. The required PDR PVL parameters are depicted in Table 4-1. The PDR PVL statements are ASCII strings, having at most 256 characters, in the form: "Parameter = Value." The Value strings shown in Table 4-1

include pre-defined values shown by single quote marks and processor determined values which include ASCII strings, International Standards Organization (ISO) times, and integers to be filled in with appropriate values by an NSIDC VØ System processor during PDR creation. An example PDR PVL for a DMF is provided in Figure 4-3. The maximum allowed message length for a PDR is 1 megabyte. PDRs are validated to check that all required fields contain valid values and that the format of the PDR is correct and consistent with the standards. PDRs that adhere to the defined message standards shown in Table 4-1 are accepted and processed. Additional information on PVL valid characters can be found in the document entitled, "Consultative Committee for Space Data Systems (CCSDS), Parameter Value Language Specification (CCSD0006), Blue Book." Using the file naming convention depicted in Table 4-2, unique file names (time-based) are assigned to each PDR, so as to avoid potential overwrites (an example PDR File Naming Convention is depicted in Figure 4-4).

It is important to note that a FILE_GROUP consists of all files of one DATA_TYPE that compose a granule. (A granule is the smallest aggregation of data that can be inventoried within ECS and ordered from ECS.) All files within a FILE_GROUP are stored together in the ECS archive.

Table 4-1. PDR PVL Parameters

Parameter	Description	Type	Format/ Max Size (Bytes)	Values
ORIGINATING_SYSTEM (Optional Field)	Originator of Delivery Record	Variable String	ASCII (20)	NSIDC (Hard-coded)
TOTAL_FILE_COUNT	Total number of files to transfer	Integer	ASCII (4)	1 - 9999
EXPIRATION_TIME (Note 1)	ISO Time for data deletion from originating system. This time is set by NSIDC VØ system based on available resources.	Fixed String	ASCII (20)	GMT in for the format: yyyy-mm-ddThh:mm:ssZ, where T indicates the start of time information and Z indicates "Zulu" time. (operations tunable amount of time after PDR sent)
OBJECT	Start of file group parameters (repeat for each group of files).	Fixed String	ASCII (10)	'FILE_GROUP'
DATA_TYPE	ECS Data Type	Fixed String	ASCII (8)	Valid ECS ESDT Short Name e.g., 'NSIDC1'
NODE_NAME	Name of network node on which the file resides	Variable String	ASCII (64)	e.g., 'calibsrv.nasa.gov'
OBJECT	Start of file parameters (repeat for each file in file group)	Fixed String	ASCII (9)	'FILE_SPEC'
DIRECTORY_ID	File directory name (i.e. path name)	Variable String	ASCII (Note 2)	e.g., /NSIDC1/CAL1/
FILE_ID	File name	Variable String	ASCII (Note 3)	NSIDC file name (per NSIDC Data/Metadata File Definition)
FILE_TYPE	File Data Type	Variable String	ASCII (20)	'METADATA' or 'SCIENCE'
FILE_SIZE	Length of file in bytes	Unsigned 32-bit Integer	ASCII (10)	< 2 GB
END_OBJECT	End of file parameters (repeat for each file)	Fixed String	ASCII (9)	'FILE_SPEC'
END_OBJECT	End of file group (repeat for each group of files)	Fixed String	ASCII (10)	'FILE_GROUP'

Note 1. Only used when PDR server is not under ECS control.

Note 2. Size can vary up to 256 bytes total when DIRECTORY_ID is combined with FILE_ID.

Note 3. Size can vary up to 256 bytes total when FILE_ID is combined with DIRECTORY_ID.

```
EXAMPLE ONLY                                                    EXAMPLE ONLY

ORIGINATING_SYSTEM = NSIDC;    /* EDP Identifier */
TOTAL_FILE_COUNT = 2;
EXPIRATION_TIME = 1997-04-06T05:23:06Z;
OBJECT = FILE_GROUP;
        DATA_TYPE = NSIDC1;    /* Valid ESDT Short Name allowed by ECS */
        NODE_NAME = calibsrv.nasa.gov;
        OBJECT = FILE_SPEC;
                DIRECTORY_ID = NSIDC1/TBD1/;
                FILE_ID = NSIDC TBD.01A;     /* '01' = File #,  'A' = Version */
                FILE_TYPE = SCIENCE;    /* Allowed values pre-defined by ECS */
                FILE_SIZE = 1000000;
        END_OBJECT = FILE_SPEC;
        OBJECT = FILE_SPEC;
                DIRECTORY_ID = NSIDC1/TBD2/;
                FILE_ID = NSIDC TBD.02A;
                FILE_TYPE = METADATA;    /* Allowed values pre-defined by ECS */
                FILE_SIZE = 1000000;
        END_OBJECT = FILE_SPEC;
        ------------------------------------------------------------------------------------
        /* Repeat FILE_SPEC objects for each NSIDC data file within file group */
        ------------------------------------------------------------------------------------
END_OBJECT = FILE_GROUP;
        ------------------------------------------------------------------------------------
        /* Repeat FILE_GROUP objects for each different file group */
        ------------------------------------------------------------------------------------
```

Figure 4-3. Example PDR PVL

Table 4-2: File Naming Convention For Product Delivery Record

Field	Description	Format/ Type Max Size (Bytes)	Value
NSIDC Designation	Designation for NSIDC	ASCII String (20)	Originating System in PDR
PDR Creation Date	Date when PDR was created	ASCII (14)	yyyymmddhhmmss
Filename extension	Extension for file PDR filename	ASCII String (3)	'PDR'

EXAMPLE ONLY **EXAMPLE ONLY**

FILENAME = NSIDC123.20010719123845.PDR,

where

20010719123845 = date = yyyymmddhhmmss

Figure 4-4. Example PDR File Naming Convention

4.3.3 Product Delivery Record Discrepancy (PDRD)

The PDRD is sent by ECS to the supplier system (i.e., NSIDC VØ System), via both ftp and e-mail, only in the event that the PDR cannot be successfully validated. The subject of the e-mail message is the PDRD file name and the e-mail address is an operator-tunable parameter. The PDRD identifies the error/success dispositions for file groups in the PDR resulting from ECS's attempt to validate the PDR. The PDRD uses the same naming convention used by the PDR, except that the filename extension is 'PDRD' for the PDRD instead of the 'PDR' used for the PDR. There are two forms of PDRD, including a short form (Table 4-3) and long form (Table 4-4). The short form is used for a PDR when the first error encountered in each file group within the PDR is the same or the first error found applies to each group. The long form is used when one or more file groups in the PDR have invalid parameters; some file groups may be error-free. For each file group, if an error is encountered, ECS halts processing and reports the error which it just encountered for that file group. All remaining conditions in that file group are not validated. ECS processing then continues on with the next file group in the PDR. The dispositions in the Long PDRD will be reported for all file groups in the order listed in the PDR. In the event that a PDRD is returned to the NSIDC VØ System, none of the files are transferred to the ECS for processing, and the NSIDC VØ System must correct the errors and resubmit the entire PDR for processing. The PDRD consists of PVL Statements. Short and Long PDRD PVL examples are provided, respectively, in Figure 4-5 and Figure 4-6.

Table 4-3. Short Product Delivery Record Discrepancy PVL Parameters

Parameter[2]	Description	Type/Format (Length in Bytes)	Value[2]
MESSAGE_TYPE	Short Product Delivery Record Discrepancy	Fixed String/ASCII (9)	SHORTPDRD
DISPOSITION	Disposition of Ingest Request[1]	Variable String/ASCII (64)	One of the following: "INVALID FILE COUNT" "ECS INTERNAL ERROR" "DATABASE FAILURES" "INVALID PVL STATEMENT" "MISSING OR INVALID ORIGINATING_SYSTEM PARAMETER" "DATA PROVIDER REQUEST THRESHOLD EXCEEDED" "DATA PROVIDER VOLUME THRESHOLD EXCEEDED" "SYSTEM REQUEST THRESHOLD EXCEEDED" "SYSTEM VOLUME THRESHOLD EXCEEDED"

Note 1. In any given instance, only one disposition value is provided. In cases where multiple errors may exist, the disposition value corresponding to the first error encountered will be provided.
Note 2. Each parameter/value is followed by an EOL mark.

EXAMPLE ONLY **EXAMPLE ONLY**

MESSAGE TYPE = SHORTPDRD;
DISPOSITION = "DATABASE FAILURES";

Figure 4-5. Example Short PDRD PVL

Table 4-4. Long Product Delivery Record Discrepancy PVL Parameters

Parameter[2]	Description	Type/Format (Length in Bytes)	Value[2]
MESSAGE_TYPE	Long Product Delivery Record Discrepancy	Fixed String/ASCII (8)	LONGPDRD
NO_FILE_GRPS (to follow)	Number of File Groups in the PDR	Integer/ASCII (4)	Number of File Groups in the PDR
For each file group in the PDR			
DATA_TYPE	ECS Data Type	ASCII String (20)	DATA_TYPE in PDR
DISPOSITION	Disposition of Ingest Request[1]	Variable String/ASCII (64)	One of the following: "SUCCESSFUL" "INVALID DATA TYPE" * "INVALID DIRECTORY" * "INVALID FILE SIZE" "INVALID FILE ID" * "INVALID NODE NAME" * "INVALID FILE TYPE" *

Note 1. For each file group, only one disposition value may be provided. In cases where multiple errors may exist, the disposition value corresponding to the first error encountered will be provided.
Note 2. Each parameter/value statement is followed by an EOL mark.
Note 3. PDRD data type disposition pair order matches file group order in PDR.
* Null string check only

EXAMPLE ONLY **EXAMPLE ONLY**

```
MESSAGE_TYPE = LONGPDRD;
NO_FILE_GRPS = 3;
DATA_TYPE = NSIDC _TBD1;
DISPOSITION = "INVALID DATA TYPE";
DATA_TYPE = NSIDC _TBD2;
DISPOSITION = "INVALID FILE ID";
DATA_TYPE = NSIDC _TBD3;
DISPOSITION = "SUCCESSFUL";
```

Figure 4-6. Example Long PDRD PVL

4.3.4 Production Acceptance Notification (PAN)

After the data have been ingested and archived by ECS, ECS automatically sends a "Production Acceptance Notification (PAN)" via ftp to the supplier system (i.e., NSIDC VØ System). The PAN file announces the completion of data transfer and archival, and identifies any errors or problems that have been encountered. The PAN uses the same naming convention used by the PDR, except that the filename extension is 'PAN' for the PAN instead of the 'PDR' used for the PDR. There are two forms of the PAN available for use, including a short (Table 4-5) and a long (Table 4-6) form. The short form of the PAN is sent to acknowledge that all files have been

successfully transferred, or to report errors which are not specific to individual files but which have precluded processing of any and all files (e.g., ftp failure). If all files in a request do not have the same disposition, a long form of this message is employed. For each file in a file group, if an error is encountered, ECS halts processing and reports the error which it just encountered for that file. All remaining conditions in that file are not validated. ECS processing then continues on with the next file in the file group. If there are no more files to process in the file group, ECS processing then continues on with the next file group in the PDR. The PAN consists of PVL Statements. Short and Long PAN PVL examples are provided, respectively, in Figure 4-7 and Figure 4-8.

Table 4-5. Short Production Acceptance Notification PVL Parameters

Parameter[2]	Description	Type/Format (Length in Bytes)	Value[2]
MESSAGE_TYPE	Short Production Acceptance Notification Definition	Fixed String/ASCII (8)	SHORTPAN
DISPOSITION	Disposition of Ingest Request[1]	Variable String/ASCII (64)	One of the following: "SUCCESSFUL" "NETWORK FAILURE" "UNABLE TO ESTABLISH FTP/KFTP CONNECTION" "ALL FILE GROUPS/FILES NOT FOUND" "FTP/KFTP FAILURE" "POST-TRANSFER FILE SIZE CHECK FAILURE" "FTP/KFTP COMMAND FAILURE" "DUPLICATE FILE NAME IN GRANULE" "METADATA PREPROCESSING ERROR" "RESOURCE ALLOCATION FAILURE" "ECS INTERNAL ERROR" "DATA BASE ACCESS ERROR" "INCORRECT NUMBER OF METADATA FILES" "INCORRECT NUMBER OF SCIENCE FILES" "INCORRECT NUMBER OF FILES" "DATA CONVERSION FAILURE" "REQUEST CANCELLED" "UNKNOWN DATA TYPE" "INVALID OR MISSING FILE TYPE" "FILE I/O ERROR" "DATA ARCHIVE ERROR"
TIME_STAMP	ISO Time when Destination System transferred the last part of data	ASCII (20)	GMT in the format: yyyy-mm-ddThh:mm:ssZ, where T indicates the start of time information and Z indicates "Zulu" time (Null if disposition is not "SUCCESSFUL")

Note 1. In any given instance, only one disposition value may be provided. In cases where multiple errors have occurred, the disposition value corresponding to the first error encountered will be provided.
Note 2. Each parameter/value statement is followed by an EOL mark.

EXAMPLE ONLY **EXAMPLE ONLY**

```
MESSAGE_TYPE = SHORTPAN;
DISPOSITION = "POST-TRANSFER FILE SIZE CHECK FAILURE";
TIME_STAMP = 1996-06-23T09:46:35Z;
```

Figure 4-7. Example Short PAN PVL

Table 4-6. Long Production Acceptance Notification PVL Parameters

Parameter[2]	Description	Type/Format (Length in Bytes)	Value[2]
MESSAGE_TYPE	Long Production Acceptance Notification	Fixed String/ASCII (7)	LONGPAN
NO_OF_FILES	Number of Files in PDR	ASCII (4)	TOTAL_FILE_COUNT parameter in PDR
For each File in the PDR			
FILE_DIRECTORY	ASCII string specifying file directory location	ASCII (<256) Equivalent to PDR length	DIRECTORY_ID parameter in PDR
FILE_NAME	File names on system creating PDR	ASCII (<256) Equivalent to PDR length	FILE_ID parameter in PDR
DISPOSITION	Disposition of Ingest Request[1]	Variable String/ASCII (64)	One of the following: "SUCCESSFUL" "NETWORK FAILURE" "UNABLE TO ESTABLISH FTP/KFTP CONNECTION" "ALL FILE GROUPS/FILES NOT FOUND" "FTP/KFTP FAILURE" "POST-TRANSFER FILE SIZE CHECK FAILURE" "FTP/KFTP COMMAND FAILURE" "DUPLICATE FILE NAME IN GRANULE" "METADATA PREPROCESSING ERROR" "RESOURCE ALLOCATION FAILURE" "ECS INTERNAL ERROR" "DATA BASE ACCESS ERROR" "INCORRECT NUMBER OF METADATA FILES" "INCORRECT NUMBER OF SCIENCE FILES" "INCORRECT NUMBER OF FILES" "DATA CONVERSION FAILURE" "REQUEST CANCELLED" "UNKNOWN DATA TYPE" "INVALID OR MISSING FILE TYPE" "FILE I/O ERROR" "DATA ARCHIVE ERROR"
TIME_STAMP	ISO Time when Destination System transferred the last part of the data	ASCII (20)	GMT in the format: yyyy-mm-ddThh:mm:ssZ, where T indicates the start of time information and Z indicates "Zulu" time. (Null if disposition is not "SUCCESSFUL")

Note 1. In any given instance, only one disposition value may be provided. In cases where multiple errors have occurred, the disposition value corresponding to the first error encountered will be provided.

Note 2. Each parameter/value statement is followed by an EOL mark.

EXAMPLE ONLY **EXAMPLE ONLY**

```
MESSAGE_TYPE = LONGPAN;
NO_OF_FILES = 3;
FILE_DIRECTORY = NSIDC1/TBD1;
FILE_NAME =NSIDC TBD.01A;
DISPOSITION = “UNABLE TO ESTABLISH FTP/KFTP CONNECTION”;
TIME_STAMP = 1996-04-28T23:49:59Z;
FILE_DIRECTORY = NSIDC1/TBD2;
FILE_NAME =NSIDC TBD.02A;
DISPOSITION = “ECS INTERNAL ERROR”;
TIME_STAMP = 1996-04-28T23:59:59Z;
FILE_DIRECTORY = NSIDC1/TBD2;
FILE_NAME =NSIDC TBD.03A;
DISPOSITION = “SUCCESSFUL”;
TIME_STAMP = 1996-04-28T23:59:59Z;
```

Figure 4-8. Example Long PAN PVL

4.3.5 ECS/NSIDC VØ System Electronic Data Exchange Error Handling/Back-up Methods

Exchange of data on physical media is used for data transfer back-up. ECS provides hard media ingest as described in the Release B SDPS Ingest Subsystem (INS) Design Specification for the ECS Project. The hard media received by ECS must provide information describing the data being transferred. This information is provided in standard PVL form, and relates the same information as provided in the PDR used with the Polling Ingest with PDR process.

During the course of data exchange via ftp, the following typical error conditions may arise:

- Failure to establish TCP/IP connection
- Erroneous ftp command
- File not found (listed in PDR, but not found on disk)
- File not readable due to permissions

Should a problem develop during an ftp file transfer due to any of the above error conditions, an operator-tunable number of attempts are made to pull the data. In the event that problems cannot be resolved within this operator-tunable number of attempts, ECS and the NSIDC VØ System operations personnel have the option to coordinate data delivery on a variety of approved high density storage media including the following:

a. 8 mm tape [112 meters; 5 GB standard capacity]

b. 4 mm digital audio tape (DAT) [90 meters; 2 GB standard capacity]

While the use of tape media as a backup may not be a requirement, it may be useful during emergencies, and is supported by both ECS and the NSIDC VØ System. Physical media tapes are to be sent to the ECS from the NSIDC VØ System. ECS ingests and archives the NSIDC data delivered on physical media received in good condition. In the event that tape media are used during emergencies, a separate Physical Media Product Delivery Record (PMPDR) file must be supplied for each piece of media delivered to ECS. The PMPDR must, both be contained as a file on the media, and be available separately as hard copy---in the event that a file check on the media by ECS reveals that the PMPDR is missing. The format and information content for the PMPDR is the same as that for the PDR defined in Table 4-1.

ECS expects to receive the data uncompressed. The TAR tape format is used---no absolute path is used when creating the TAR file. The PMPDR file must be either available on the PMPDR packing list delivered with the tape or have file extension .PDR or .MDR. The Directory ID is optional on the PMPDR. Subdirectories can be used within the TAR file, as long as the Directory ID is provided in the Delivery Record. Paper labels for each tape identify the names of files contained on the tape and the order in which these files have been written---the use of bar code labeling is optional.

4.3.6 ECS/NSIDC VØ System Electronic Data Exchange Security

Standard ftp login procedures, including the use of a password, must be used whenever ECS polls the NSIDC VØ System's disk. User IDs and passwords are needed for ftp connections and are maintained by ECS. It is recommended that User IDs and passwords be changed, via the DAAC administrator, periodically (on the order of every six months) or whenever a system compromise is suspected.

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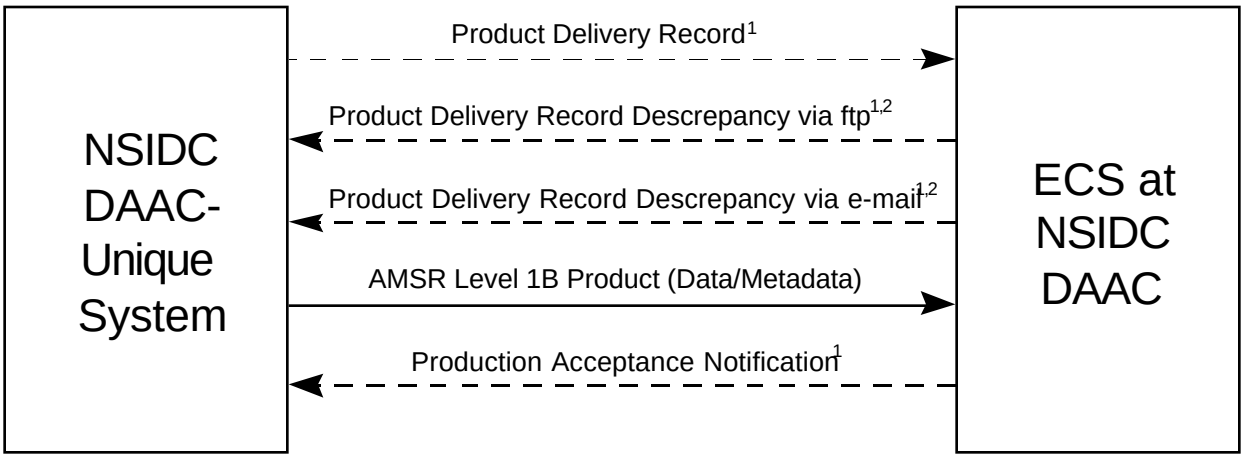
5. Data Flow Descriptions

Figure 5-1 identifies the data flows between the ECS and the NSIDC DAAC-Unique System. Descriptions of the data exchange framework supporting these flows are found in Section 4 of this ICD. Each data flow shown in Figure 5-1 is described in this section. A description of each interface is provided. The direction of data flow is indicated. And if appropriate, the object classes that support an interface are identified along with a pointer to where design detail on the object class can be found.



[1] Defined in Section 4
[2] Only generated if errors are found in Product Delivery Record

Figure 5-1. ECS/NSIDC DAAC-Unique System Context Diagram

5.1 Data Product Sets

5.1.1 AMSR Level 1B Data Product

The NSIDC DAAC-Unique System provides Advanced Earth Observing System II (ADEOS-II) Advanced Microwave Scanning Radiometer (AMSR) Level 1B data product to ECS for archival and distribution.

The AMSR is a 14-channel, 8- frequency passive microwave radiometer which measures microwave radiation from the Earth's surface and atmosphere. Frequencies of the AMSR are 6.9, 10.7, 18.7, 23.8, 36.5, and 89.0 (horizontal and vertical polarization), and 50.3 and 52.8 GHz (vertical polarization only). AMSR has a field of view of 7 km at 89 GHz and 60km at 6.9 GHz. It scans conically at an incidence angle of 55 degrees to achieve a 1600 km swath width. Data are externally calibrated by a cold sky temperature (2.7K) and a high-temperature hot load.

Various geophysical parameters will be retrieved from AMSR data. These parameters are primarily concerned with water and include total water vapor content, total liquid water content, precipitation, snow water equivalent, soil moisture, sea surface temperature, sea surface wind speed, and sea ice extent. The data obtained by AMSR will aid in the understanding of the water and energy cycle on a global scale.

File Name: TBD-1

ESDT Short Name: TBD-2

File Size: 43.9 MB

Frequency: Approximately once every 101 minutes (once per orbit)

Release: B1

Ingesting DAAC: NSIDC

The format of these data is defined in TBD-3. The metadata for this file are contained in the header of the file. The format of the metadata is also defined in TBD-3.

Appendix A.
Work-off Plan for Release B ECS-NSIDC DAAC ICD

ICD Issue #	ICD Para. #	Issue Priority*	ICD Issue Type - Description	Work-off Plan Task(s)	Projected Resolution Date	Risk Assessment**
1	5.1.1	B	Identify AMSR File Name	Work with NSIDC to get file name once firmed up.	12/31/97	Minimal risk.
2	5.1.1	B	Identify ESDT Short Name for AMSR Level 1B product	Coordinate with ECS Science Office to get ESDT name.	9/30/97	Minimal risk.
3	5.1.1	A	Identify AMSR Level 1B product format document	Draft format information has been received from NSIDC. Work with NSIDC to get final documentation once format is firmed up.	12/31/97	Moderate risk. This information is required for writing ingest code.

* Issue Priority Definition:
A = Design impact; e.g., unresolved interface.
B = Minimal design impact; e.g., content or format of a specific field unresolved.
C = No design impact - administrative detail; e.g., reference document # not available.

** Risk Assessment Definition:
- Risk if issue is not resolved by projected resolution date

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Abbreviations and Acronyms

ACL	Access Control List
ARP	Address Resolution Protocol
ADEOS-II	Advanced Earth Observing System II
AMSR	Advanced Microwave Scanning Radiometer
CCB	Configuration Control Board
CCR	Configuration Change Request
CDR	Critical Design Review
CDRL	Contract Data Requirements List
CSMS	Communications and System Management Segment
DAAC	Distributed Active Archive Center
DCE	Distributed Computing Environment
DCN	Document Change Notice
DMF	Data/Metadata File
DMSP	Defense Meteorological Sensing Platform
EBnet	Ethernet Backbone Network
ECS	EOSDIS Core System
EOL	end of line
EOS	Earth Observing System
EOSDIS	EOS Data and Information System
ESDIS	Earth Science Data and Information System
FDDI	Fiber Distributed Data Interface
ftp	File Transfer Protocol
HTML	Hypertext Markup Language
HTTP	Hypertext Transfer Protocol
I&T	integration and test
I/F	interface

ICD	Interface Control Document
ICMP	Internet Control Message Protocol
IP	Internet Protocol
IPA	Inter-Project Agreement
IRD	Interface Requirements Document
ISO	International Standards Organization
LAN	Local Area Network
MB	Megabyte (10^6 bytes)
N/A	Not Applicable
NASA	National Aeronautics & Space Administration
NSIDC	National Snow and Ice Data Center
ODL	Object Description Language
OODCE	Object Oriented Distributed Computing Environment
OSF	Open System Foundation
OSI	Open System Interconnection
PAN	Production Acceptance Notification
PDR	Product Delivery Record
PDRD	Product Delivery Record Discrepancy
PMPDR	Physical Media Product Delivery Record
PVL	Parameter Value Language
RIP	Routing Information Protocol
RPC	Remote Procedure Call
SDPS	Science Data Processing Segment
SMTP	Simple Mail Transfer Protocol
SNMP	Simple Network Management Protocol
SSM/I	Special Sensor Microwave Imager
TBD	To Be Determined
TBR	To Be Reviewed, To Be Resolved

TBS	To Be Supplied
TCP	Transmission Control Protocol
TCP/IP	Transmission Control Protocol/Internet Protocol
VØ	Version Ø
V1	Version 1

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